

(19)

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(11)

EP 1 233 444 A3

(12)

## EUROPEAN PATENT APPLICATION

(88) Date of publication A3:  
11.12.2002 Bulletin 2002/50

(51) Int Cl.7: H01L 25/065, H01L 21/60

(43) Date of publication A2:  
21.08.2002 Bulletin 2002/34

(21) Application number: 02009643.4

(22) Date of filing: 02.04.1993

(84) Designated Contracting States:  
CH DE ES FR GB IE IT LI SE

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(30) Priority: 08.04.1992 US 865412

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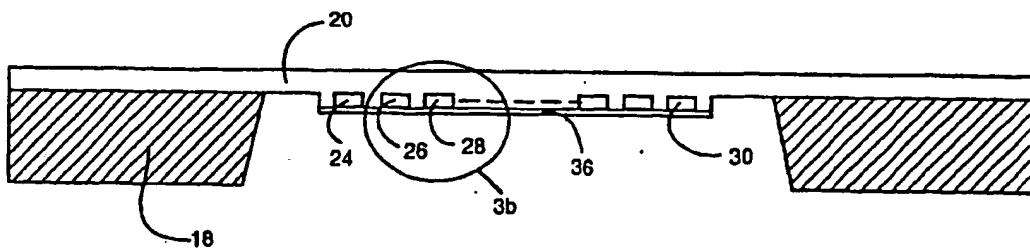
(62) Document number(s) of the earlier application(s) in  
accordance with Art. 76 EPC:  
93910567.2 / 0 641 485

(74) Representative: Wombwell, Francis et al  
Potts, Kerr & Co.  
15, Hamilton Square  
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(54) Membrane dielectric isolation ic fabrication

(57) General purpose methods for the fabrication of integrated circuits (24, 26, 28, ... 30) from flexible membranes (20, 36) formed of very thin low stress dielectric materials, such as silicon dioxide or silicon nitride, and semiconductor layers. Semiconductor device (24, 26, 28, ... 30) are formed in a semiconductor layer of the membrane (36). The semiconductor membrane layer (36) is initially formed from a substrate (18) of standard thickness, and all but a thin surface layer of substrate is then etched or polished away. In another version, the

flexible membrane is used as support and electrical interconnect for conventional integrated circuit die bonded thereto, with the interconnect formed in multiple layers in the membrane. Multiple die can be connected to one such membrane which is then packaged as a multichip module. Other applications are based on (circuit) membrane processing for bipolar and MOSFET transistor fabrication, low impedance conductor interconnecting fabrication, flat panel displays, maskless (direct write) lithography, and 3D IC fabrication.



*Fig\_3a*



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## EUROPEAN SEARCH REPORT

Application Number  
EP 02 00 9643

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.CLS)						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
X	US 4 693 770 A (HATADA KENZO) 15 September 1987 (1987-09-15) * the whole document * ---	1-4,7	H01L25/065 H01L21/60						
X	PATENT ABSTRACTS OF JAPAN vol. 014, no. 263 (E-0938), 7 June 1990 (1990-06-07) -& JP 02 082564 A (NEC CORP), 23 March 1990 (1990-03-23) * abstract * ---	1-5,7,8							
X	"PARTITIONING FUNCTION AND PACKAGING OF INTEGRATED CIRCUITS FOR PHYSICAL SECURITY OF DATA", IBM TECHNICAL DISCLOSURE BULLETIN, IBM CORP. NEW YORK, US, VOL. 32, NR. 1, PAGE(S) 46-49 XP000033241 ISSN: 0018-8689 * the whole document * ---	1-4,7							
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 303 (E-1228), 3 July 1992 (1992-07-03) -& JP 04 083371 A (TOSHIBA CORP), 17 March 1992 (1992-03-17) * abstract * ---	1-4,7	TECHNICAL FIELDS SEARCHED (Int.CLS)						
P,X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 352 (E-1241), 29 July 1992 (1992-07-29) -& JP 04 107964 A (HITACHI LTD), 9 April 1992 (1992-04-09) * abstract; figures 1-3 * ---	1-4,7,8 -/-	H01L						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>8 October 2002</td> <td>Zeisler, P</td> </tr> </table> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  D : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>				Place of search	Date of completion of the search	Examiner	THE HAGUE	8 October 2002	Zeisler, P
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THE HAGUE	8 October 2002	Zeisler, P							



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**Application Number**

EP 02 00 9643

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

## **LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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## EUROPEAN SEARCH REPORT

Application Number  
EP 02 00 9643

DOCUMENTS CONSIDERED TO BE RELEVANT															
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CLS)												
P, X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 521 (E-1285), 27 October 1992 (1992-10-27) -& JP 04 196263 A (MITSUBISHI ELECTRIC CORP), 16 July 1992 (1992-07-16) * abstract *	1-4,7													
X	WO 92 03848 A (LSI LOGIC EUROP) 5 March 1992 (1992-03-05) * the whole document *	9-11													
X	US 4 897 708 A (CLEMENTS KEN) 30 January 1990 (1990-01-30) * the whole document *	9,10													
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 291 (E-1224), 26 June 1992 (1992-06-26) -& JP 04 076946 A (FUJITSU LTD), 11 March 1992 (1992-03-11) * abstract *	9,10													
X	EP 0 314 437 A (LASER DYNAMICS INC) 3 May 1989 (1989-05-03) * the whole document *	9,10													
X	DE 32 33 195 A (MITSUBISHI ELECTRIC CORP) 17 March 1983 (1983-03-17) * the whole document *	9,10													
A	US 4 983 251 A (HAISMA JAN ET AL) 8 January 1991 (1991-01-08) * column 6, line 19 - line 66; figure 18 *	11													
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)												
<p>The present search report has been drawn up for all claims</p> <table border="1"> <tr> <td>Place of search</td> <td>Date of completion of the search</td> <td>Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>8 October 2002</td> <td>Zeisler, P</td> </tr> <tr> <td colspan="3">           CATEGORY OF CITED DOCUMENTS            X : particularly relevant if taken alone            Y : particularly relevant if combined with another document of the same category            A : technological background            O : non-written disclosure            P : intermediate document         </td> </tr> <tr> <td colspan="3">           T : theory or principle underlying the invention            E : earlier patent document, but published on, or after the filing date            D : document cited in the application            L : document cited for other reasons            S : member of the same patent family, corresponding document         </td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	8 October 2002	Zeisler, P	CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons S : member of the same patent family, corresponding document		
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THE HAGUE	8 October 2002	Zeisler, P													
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LACK OF UNITY OF INVENTION  
SHEET B

Application Number  
EP 02 00 9643

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-8

Compression bonding first and second integrated circuits

2. Claims: 9-11

Method of information processing through vertical transmission paths

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 00 9643

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-10-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 4693770	A	15-09-1987	JP	1693579 C	17-09-1992
			JP	3057618 B	02-09-1991
			JP	62009642 A	17-01-1987
			DE	3686457 D1	24-09-1992
			DE	3686457 T2	11-02-1993
			EP	0208494 A2	14-01-1987
			KR	9008665 B1	26-11-1990
JP 02082564	A	23-03-1990	NONE		
JP 04083371	A	17-03-1992	NONE		
JP 04107964	A	09-04-1992	NONE		
JP 04196263	A	16-07-1992	NONE		
WO 9203848	A	05-03-1992	WO	9203848 A2	05-03-1992
US 4897708	A	30-01-1990	US	4954875 A	04-09-1990
JP 04076946	A	11-03-1992	NONE		
EP 0314437	A	03-05-1989	US	4954875 A	04-09-1990
			DE	3872828 D1	20-08-1992
			DE	3872828 T2	11-02-1993
			EP	0314437 A1	03-05-1989
			JP	2001152 A	05-01-1990
			JP	2117118 C	06-12-1996
			JP	8017223 B	21-02-1996
DE 3233195	A	17-03-1983	JP	58043554 A	14-03-1983
			DE	3233195 A1	17-03-1983
US 4983251	A	08-01-1991	NL	8501773 A	16-01-1987
			AU	585355 B2	15-06-1989
			AU	5885486 A	24-12-1986
			CA	1245776 A1	29-11-1988
			DE	3676367 D1	07-02-1991
			EP	0209173 A1	21-01-1987
			ES	556144 D0	01-07-1987
			ES	8707023 A1	16-09-1987
			JP	2608548 B2	07-05-1997
			JP	61294846 A	25-12-1986